OBSERVATIONS & RECOMMENDATIONS

After reviewing data collected from **HARVEY LAKE** the program coordinators recommend the following actions.

FIGURE INTERPRETATION

- Figure 1: These graphs illustrate concentrations of chlorophyll-a in the water column. Algae are microscopic plants that are a natural part of lake ecosystems. Algae contain chlorophyll-a, a pigment necessary for photosynthesis. A measure of chlorophyll-a can indicate the abundance of algae in a lake. The historical data (the bottom graph) show a *fairly stable, but variable,* in-lake chlorophyll-a trend. Chlorophyll-a concentrations in June were representative of an algae bloom and golden-brown algae were dominant at that time. Phosphorus concentrations were elevated this season and could have caused an excess amount of algae to grow in the lake. While algae are present in all lakes, an excess amount of any type is not welcomed. Concentrations can increase when there are external and internal sources of phosphorus, which is the nutrient algae depend upon for growth. It's important to continue the education process and keep residents aware of the sources of phosphorus and how it influences lake quality.

- Figure 2: Water clarity is measured by using a Secchi disk. Clarity, or transparency, can be influenced by such things as algae, sediments from erosion, and natural colors of the water. The graphs on this page show historical and current year data. The lower graph shows a *fairly stable* trend in lake transparency. Water clarity was low in June due to the algae bloom, but rebounded by July. The 2000 sampling season was considered to be wet and, therefore, average transparency readings are expected to be slightly lower than last year's readings. Higher amounts of rainfall usually cause more eroding of sediments into the lake and streams, thus decreasing clarity.

- Figure 3: These figures show the amounts of phosphorus in the epilimnion (the upper layer in the lake) and the hypolimnion (the lower layer); the inset graphs show current year data. Phosphorus is the limiting nutrient for plants and algae in New Hampshire waters. Too much phosphorus in a lake can lead to increases in plant growth over time. These graphs show a *slightly improving* trend for in-lake phosphorus levels, which means levels are decreasing. The increased rainfall likely caused elevated phosphorus concentrations in the epilimnion due to watershed runoff. These concentrations likely caused the algae bloom in June. The phosphorus concentration in the hypolimnion in July was caused by the turbidity of the sample. Sample contamination with bottom sediment can raise the phosphorus concentrations and does not accurately reflect the true concentration of the water. One of the most important approaches to reducing phosphorus levels is educating the public. Humans introduce phosphorus to lakes by several means: fertilizing lawns, septic system failures, and detergents containing phosphates are just a few. Keeping the public aware of ways to reduce the input of phosphorus to lakes means less productivity in the lake in the lake. Contact the VLAP coordinator for tips on educating your lake residents or for ideas on testing your watershed for phosphorus inputs.

OTHER COMMENTS

- A June bloom of golden-brown algae dominated by *Mallomonas* and *Synura* occurred this season. Golden-browns are not normally considered nuisance species such as the blue-green algae. They do not produce toxins, however they might cause the water to have a fishy odor and taste. Golden-brown algae are common in the spring and fall, while blue-greens are more prevalent in mid-summer. We recommend continued plankton sampling throughout the summer months since the blue-green alga *Microcystis* was abundant in 1999, and an algae bloom occurred in the spring this season.

- Conductivity in Inlet 1 decreased this year (Table 6). It seems that the rainy weather may have helped to flush out the Inlet and decrease the accumulation of nutrients, as seen in the 1998 season as well. Conductivity continues to be high though and Route 4 is likely a source of increased salts to the inlet. Total phosphorus also decreased in Inlet 1 (Table 8). The turbidity of the samples decreased as well, which likely yielded more accurate results. Turbidity was high last season due to low flow and stagnant waters which often raises phosphorus levels because of an increase in organic debris in the sample. The increase in flow this season kept water volume in the Inlet high enough to take clean samples. Sampling only when there is sufficient flow will ensure clean samples and accurate results.

- *E. coli* originates in the intestines of warm-blooded animals (including humans) and is an indicator of associated and potentially harmful pathogens. Bacteria concentrations were very low at the West End site (Table 12), and well below the state standard of 406 counts per 100 mL. If residents are concerned about septic system impacts, testing when the water table is high or after rains is best. Please consult the Other Monitoring Parameters section of the report for the current standards for *E. coli* in surface waters.

- A dissolved oxygen profile was not included in this year's report (Table 9). We did not use the data obtained by the students in July for the epilimnion and hypolimnion because of the negative value obtained for the hypolimnion. The June data was not included because there were not enough temperature readings to calculate percent saturations. We hope to include data from next season's sampling sessions.

NOTES

- Monitor's Note (6/13/00): Mallard ducks seen. Lake pH 5.2. No iodine was given with the plankton bottles. Left over iodine from the plankton net box was used.

USEFUL RESOURCES

Lake Smarts: The First Lake Maintenance Handbook, A Do-It-Yourself Guide to Solving Lake Problems. The Terrene Institute. (800) 726-5253, or www.terrene.org

Handle With Care: Your Guide to Preventing Water Pollution. Terrene Institute, 1991. (800) 726-5253, or www.terrene.org

Phosphorus in Lakes, WD-BB-20, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

Clean Water in Your Watershed. Terrene Institute, 1993. (800) 726-5253, or www.terrene.org

A Brief History of Lakes, NH Lakes Association pamphlet, (603) 226-0299 or www.nhlakes.org

Answers to Common Lake Questions, NHDES-WSPCD-92-12, NHDES Booklet, (603) 271-3503.

Vegetated Phosphorus Buffer Strips, NH Lakes Association pamphlet, (603) 226-0299 or www.nhlakes.org

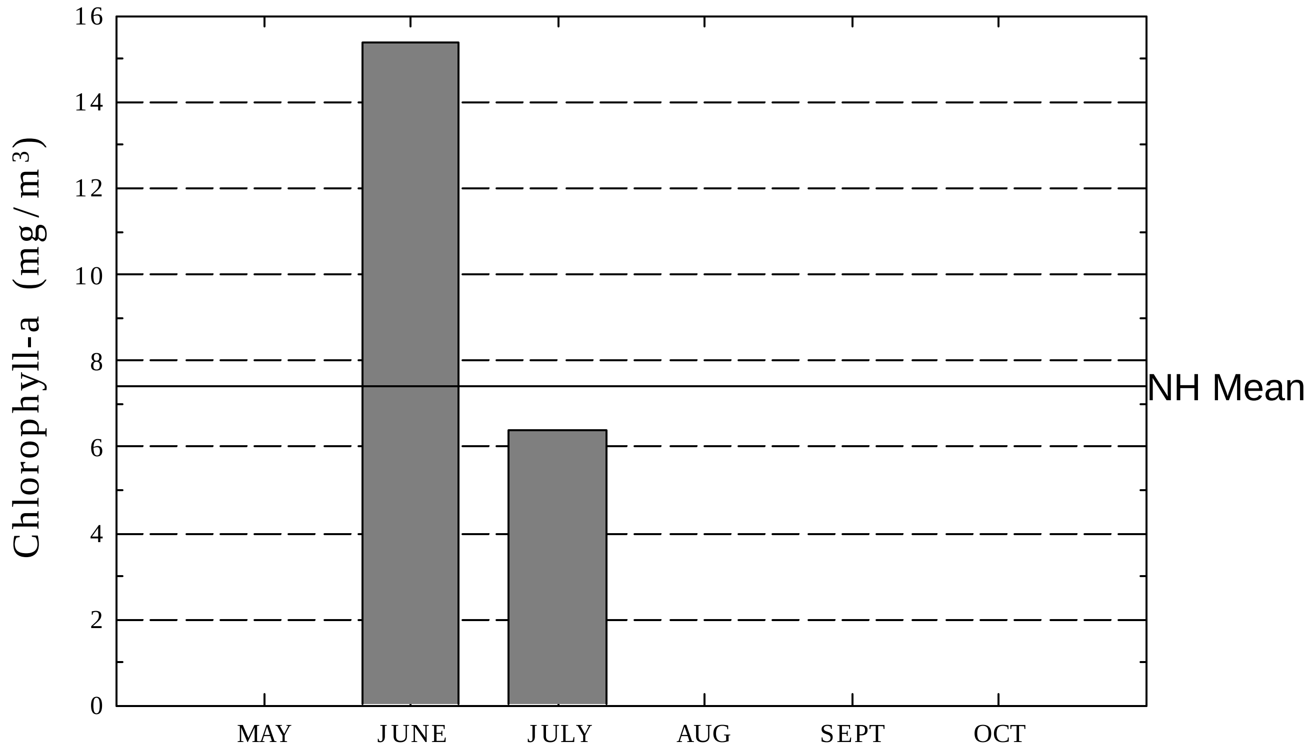
Road Salt and Water Quality, WD-WSQB-7, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

Aquatic Plants and Their Role in Lake Ecology, WD-BB-44, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

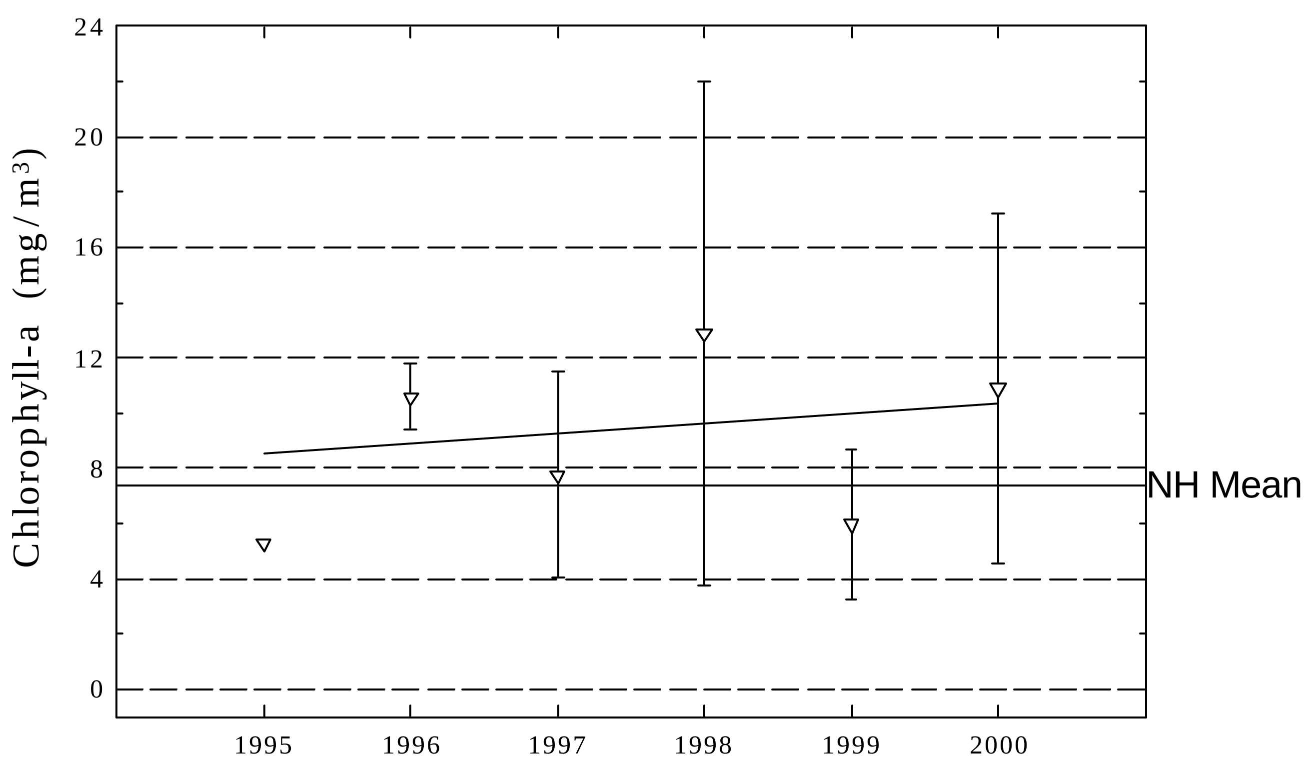
Zebra Mussels, WD-BB-17, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

Harvey Lake

Figure 1. Monthly and Historical Chlorophyll-a Results



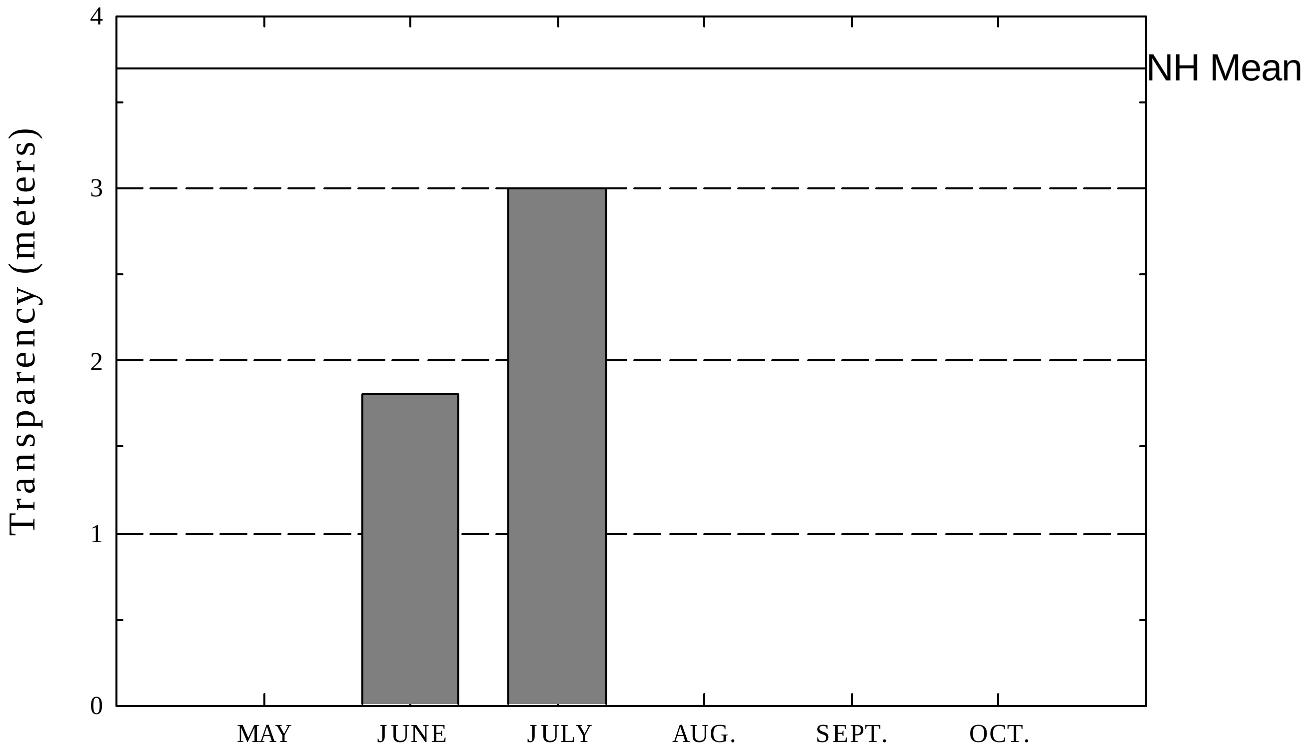
2000 Chlorophyll-a Results



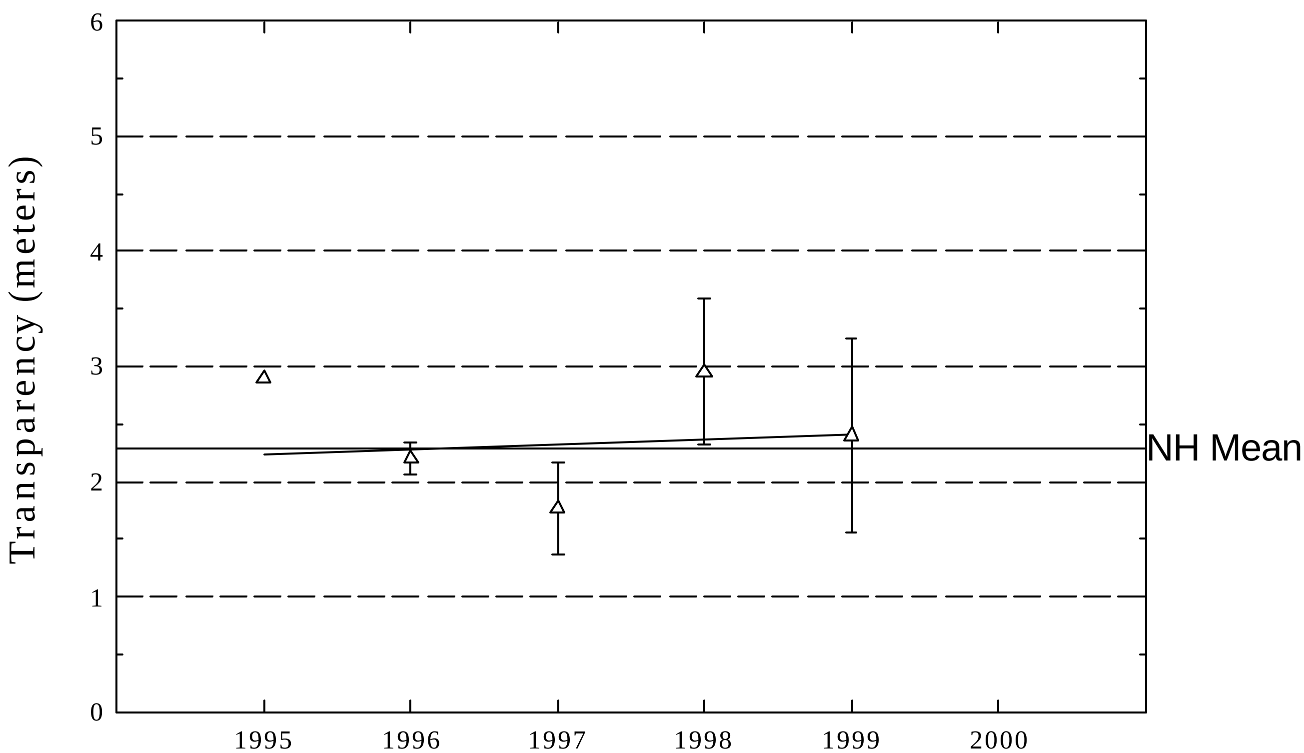
Historical Chlorophyll-a Results

Harvey Lake

Figure 2. Monthly and Historical Transparency Results



2000 Transparency Results



Historical Transparency Results

Harvey Lake

Figure 3. Monthly and Historical Total Phosphorus Data.

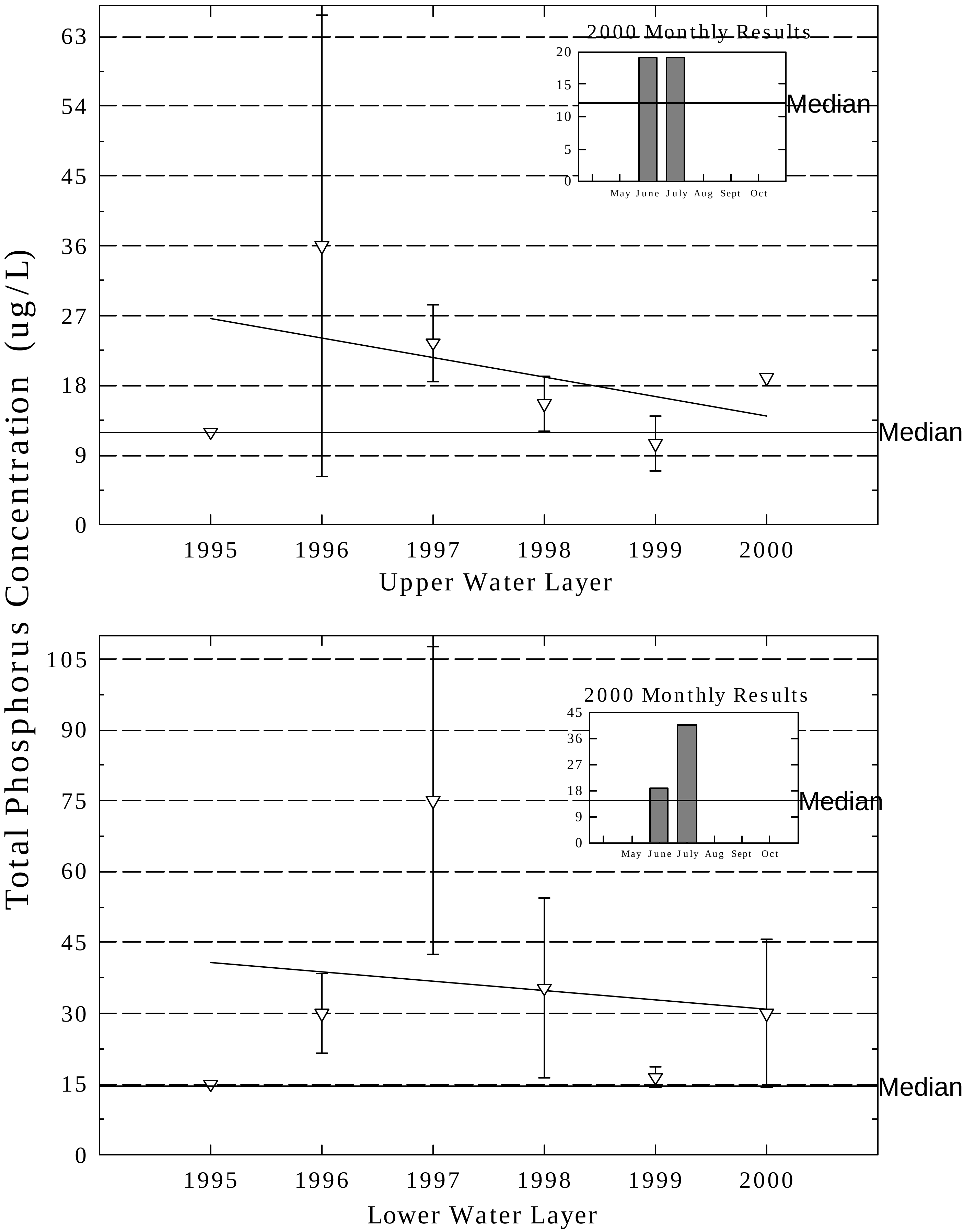


Table 1.

HARVEY LAKE

NORTHWOOD

Chlorophyll-a results (mg/m^3) for current year and historical sampling periods.

Year	Minimum	Maximum	Mean
1995	5.28	5.28	5.28
1996	9.72	11.45	10.58
1997	5.10	10.38	7.74
1998	4.41	22.54	12.87
1999	4.03	7.89	5.96
2000	6.40	15.38	10.89

Table 2.

HARVEY LAKE

NORTHWOOD

Phytoplankton species and relative percent abundance.

Summary for current and historical sampling seasons.

Date of Sample	Species Observed	Relative % Abundance
06 / 20 / 1995	ASTERIONELLA	44
	MALLOMONAS	39
	TABELLARIA	7
08 / 28 / 1996	OSCILLATORIA	69
	MICROCYSTIS	17
08 / 26 / 1997	ANABAENA	82
	COELOSPHAERIUM	16
	TABELLARIA	1
08 / 25 / 1998	COSMARIUM	97
	MELOSIRA	3
08 / 27 / 1999	MICROCYSTIS	45
	GLOEOTRICHIA	14
	TABELLARIA	10
06 / 13 / 2000	MALLOMONAS	71
	SYNURA	13
	ASTERIONELLA	9

Table 3.

HARVEY LAKE

NORTHWOOD

Summary of current and historical Secchi Disk transparency results (in meters).

Year	Minimum	Maximum	Mean
1995	2.9	2.9	2.9
1996	2.1	2.3	2.2
1997	2.0	2.2	2.1
1998	1.3	2.0	1.7
1999	2.5	3.4	2.9
2000	1.8	3.0	2.4

Table 4.

HARVEY LAKE
NORTHWOOD

pH summary for current and historical sampling seasons.
Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
EPILIMNION				
	1995	6.26	6.26	6.26
	1996	6.25	6.27	6.26
	1997	6.89	6.90	6.90
	1998	6.60	6.67	6.63
	1999	6.53	6.76	6.63
	2000	6.67	6.86	6.75
HYPOLIMNION				
	1995	6.25	6.25	6.25
	1996	6.04	6.06	6.05
	1997	6.29	6.34	6.31
	1998	6.22	6.24	6.23
	1999	6.02	6.27	6.13
	2000	6.23	6.25	6.24
INLET 1				
	1995	6.42	6.42	6.42
	1996	6.09	6.42	6.22
	1997	6.14	6.24	6.19
	1998	6.21	6.30	6.26
	1999	6.14	6.20	6.17
	2000	6.26	6.31	6.28
INLET 2				
	1996	6.13	6.13	6.13

Table 4.

HARVEY LAKE
NORTHWOOD

pH summary for current and historical sampling seasons.
Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
METALIMNION				
	1996	5.92	5.92	5.92
	1997	6.30	6.30	6.30
OUTLET				
	1995	6.67	6.67	6.67
	1996	6.31	6.56	6.42
	1997	6.52	6.68	6.59
	1998	6.59	6.76	6.67
	1999	6.47	6.49	6.48
	2000	6.71	6.71	6.71

Table 5.

HARVEY LAKE

NORTHWOOD

Summary of current and historical Acid Neutralizing Capacity.
Values expressed in mg/L as CaCO .

Epilimnetic Values

Year	Minimum	Maximum	Mean
1995	5.20	5.20	5.20
1996	3.70	4.80	4.25
1997	4.90	6.60	5.75
1998	4.70	5.20	4.90
1999	3.40	5.00	4.20
2000	4.80	5.10	4.95

Table 6.

HARVEY LAKE
NORTHWOOD

Specific conductance results from current and historic sampling seasons. Results in uMhos/cm.

Station	Year	Minimum	Maximum	Mean
EPILIMNION				
	1995	121.6	121.6	121.6
	1996	110.0	111.6	110.8
	1997	94.5	97.9	96.2
	1998	70.1	93.2	78.3
	1999	97.7	100.2	98.9
	2000	86.6	88.9	87.7
HYPOLIMNION				
	1995	119.6	119.6	119.6
	1996	113.8	115.0	114.4
	1997	99.1	101.8	100.4
	1998	68.8	121.0	95.0
	1999	97.6	98.9	98.2
	2000	88.6	94.6	91.6
INLET 1				
	1995	177.1	177.1	177.1
	1996	166.7	168.4	167.5
	1997	196.6	539.0	367.8
	1998	75.6	115.3	101.1
	1999	113.5	165.8	139.6
	2000	104.2	109.3	106.7
INLET 2				
	1996	53.7	53.7	53.7
METALIMNION				
	1996	112.4	112.4	112.4

Table 6.

HARVEY LAKE
NORTHWOOD

Specific conductance results from current and historic sampling seasons. Results in uMhos/cm.

Station	Year	Minimum	Maximum	Mean
	1997	95.8	95.8	95.8
OUTLET				
	1995	122.4	122.4	122.4
	1996	110.3	113.0	111.6
	1997	95.6	98.8	97.2
	1998	72.0	95.3	83.7
	1999	96.6	99.6	98.1
	2000	87.3	89.2	88.2

Table 8.

HARVEY LAKE
NORTHWOOD

Summary historical and current sampling season Total Phosphorus data. Results in ug/L.

Station	Year	Minimum	Maximum	Mean
EPILIMNION				
	1995	12	12	12
	1996	15	57	36
	1997	20	27	23
	1998	12	19	15
	1999	8	13	10
	2000	19	19	19
HYPOLIMNION				
	1995	15	15	15
	1996	24	36	30
	1997	52	98	75
	1998	16	54	35
	1999	15	18	16
	2000	19	41	30
INLET 1				
	1995	74	74	74
	1996	61	109	85
	1997	137	152	144
	1998	29	72	48
	1999	48	89	68
	2000	22	30	26
INLET 2				
	1996	71	71	71
METALIMNION				
	1996	44	44	44
	1997	30	30	30

Table 8.

HARVEY LAKE

NORTHWOOD

Summary historical and current sampling season Total Phosphorus data. Results in ug/L.

Station	Year	Minimum	Maximum	Mean
OUTLET				
	1995	14	14	14
	1996	16	21	18
	1997	17	17	17
	1998	14	18	15
	1999	10	15	12
	2000	13	14	13

Table 10.

HARVEY LAKE

NORTHWOOD

Historic Hypolimnetic dissolved oxygen and temperature data.

Date	**Depth** (meters)	**Temperature** (celsius)	**Dissolved Oxygen** (mg/L)	**Saturation** (%)
June 20, 1995	6.0	11.9	0.5	4.0
August 28, 1996	5.5	15.2	0.1	1.0
August 26, 1997	5.5	16.2	0.2	2.0

Table 11.

HARVEY LAKE
NORTHWOOD

Summary of current year and historic turbidity sampling.
Results in NTU's.

Station	Year	Minimum	Maximum	Mean
EPILIMNION				
	1997	0.7	2.0	1.3
	1998	0.6	1.6	1.2
	1999	0.6	0.7	0.7
	2000	0.7	0.8	0.8
HYPOLIMNION				
	1997	2.8	13.4	8.1
	1998	0.7	9.5	4.8
	1999	2.8	2.9	2.8
	2000	2.7	8.2	5.4
INLET 1				
	1997	3.6	15.1	9.3
	1998	0.9	3.5	1.9
	1999	1.4	3.4	2.4
	2000	0.7	1.2	0.9
METALIMNION				
	1997	1.0	1.0	1.0
OUTLET				
	1997	0.6	2.6	1.6
	1998	0.6	1.2	0.9
	1999	0.7	0.9	0.8
	2000	0.5	0.5	0.5

Table 12.

HARVEY LAKE

NORTHWOOD

Summary of current year bacteria sampling.
Results in counts per 100ml.

Location	Date	E. Coli See Note Below
WEST END		
	July 20	3

NOTE: "<" means "less than" and ">" means "greater than"